

We claim:

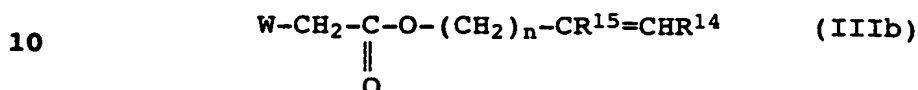
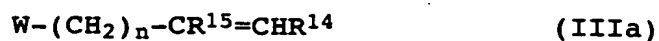
1. The use of cationic polymers obtainable by polymerization of  
5 from 3 to 30% by weight of at least one quaternary nitrogen-containing free-radically polymerizable monomer (a1) and/or a direct preproduct (a2) thereof  
10 in the presence of from 70 to 97% by weight of at least one polyether-containing compound (b) and  
optionally from 0 to 15% by weight of one or more further free-radically polymerizable monomers (c) with a solubility  
15 in water above 60 g/l at 25°C and  
optionally from 0 to 15% by weight of one or more further free-radically polymerizable monomers (d) with a solubility  
20 in water of less than 60 g/l at 25°C  
where the water content in the reaction mixture during the polymerization is less than 20% by weight, and  
25 where, in the case of the use of a preproduct (a2), this is converted at least partially into a compound containing quaternary nitrogen (a2') subsequently to or during the polymerization, and  
30 where the molar ratio of the sum of the monomers (a1), (a2') and (c) to the sum of the monomers (d) is at least 2 to 1, and  
where the percentages by weight of the individual components a1 and/or a2, b and optionally c and d add up in each case to  
35 100% by weight  
in cosmetic preparations.
2. The use as claimed in claim 1, where the monomer (a1) and/or  
40 the compound (a2') is chosen from the group consisting of quaternary vinylamines, N,N,N-trialkylaminoalkyl acrylates and methacrylates, N,N,N-trialkylaminoalkylacrylamides and -methacrylamides, 3-alkyl-1-vinylimidazoles,  
3-aryl-1-vinylimidazoles, quaternary vinylpyridines and  
45 quaternary diallylamines, and the salts.

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3. The use as claimed in claim 1 or 2, where the monomer (a1) and/or the compound (a2') is chosen from the group consisting of

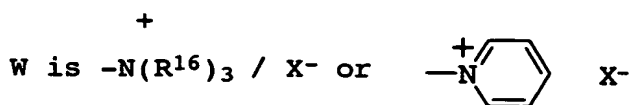
- 5 a) quaternary vinylamines of the formulae (IIIa) or (IIIb)



where

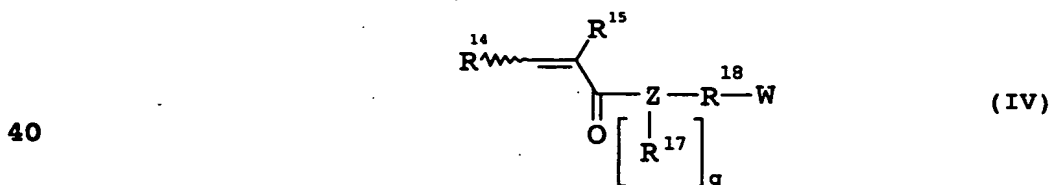
- 15  $R^{14}$  and  $R^{15}$ , independently of one another, are chosen from the group consisting of hydrogen,  $C_1$ - $C_8$  linear- or branched-chain alkyl, methoxy, ethoxy, 2-hydroxyethoxy, 2-methoxyethoxy and 2-ethoxyethyl, and

- 20  $n$  is 0, 1 or 2, and



- 25 where the radicals  $R^{16}$  may be chosen to be identical or different from the group consisting of  $C_1$ - $C_{40}$  linear- or branched-chain alkyl radicals, formyl,  $C_1$ - $C_{10}$  linear- or branched-chain acyl,  $N,N$ -dimethylaminoethyl, 2-hydroxyethyl, 2-methoxyethyl, 2-ethoxyethyl, 30 hydroxypropyl, methoxypropyl, ethoxypropyl or benzyl, and where  $X^-$  is an anion,

- b)  $N,N,N$ -trialkylaminoalkyl acrylates or methacrylates,  $N,N,N$ -trialkylaminoalkylacrylamides or -methacrylamides 35 of the formula (IV)



where  $R^{14}$ ,  $R^{15}$  and  $W$  have the same meanings as in the formulae IIIa and IIIb in claim 3 a), and

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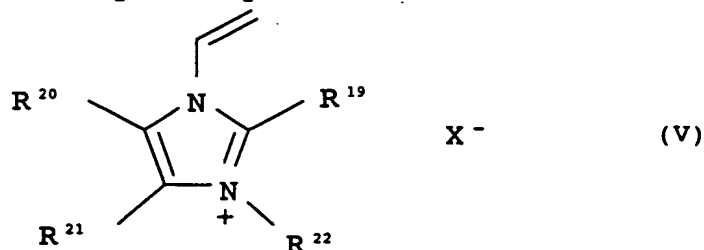
R<sup>17</sup> = hydrogen or methyl,R<sup>18</sup> = alkylene or hydroxyalkylene having 1 to 24 carbon atoms,

Z = nitrogen when g = 1 or oxygen when g = 0,

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c) quaternary N-vinylimidazoles of the formula (V)

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where

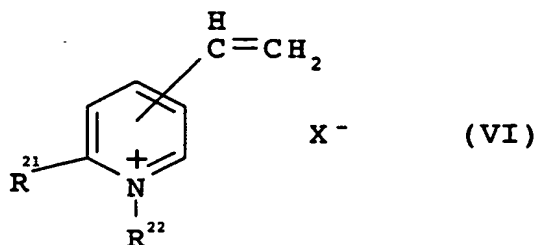
R<sup>19</sup> to R<sup>21</sup>, independently of one another, are hydrogen, C<sub>1</sub>-C<sub>4</sub>-alkyl, C<sub>1</sub>-C<sub>4</sub>-hydroxyalkyl or phenyl; and

20

R<sup>22</sup> is C<sub>1</sub>-C<sub>4</sub>-alkyl, C<sub>1</sub>-C<sub>4</sub>-hydroxyalkyl or phenyl; andand X<sup>-</sup> is an anion,

d) quaternary vinylpyridines of the formula (VI)

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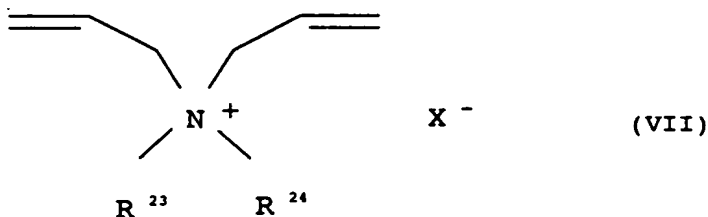
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where R<sup>21</sup>, R<sup>22</sup> and X<sup>-</sup> have the same meanings as in the formula (V) in claim 3 c),

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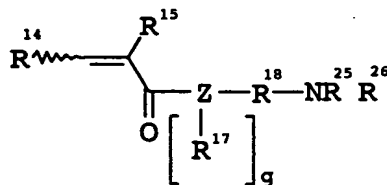
e) quaternary diallylamines of the formula (VII)

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where R<sup>23</sup> and R<sup>24</sup> in each case and independently of one another may be C<sub>1</sub>- to C<sub>24</sub>-alkyl, and X<sup>-</sup> is an anion.

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4. The use as claimed in any of claims 1 to 3, where the monomer (a1) and/or the compound (a2') is chosen from N,N,N-trimethylaminomethyl (meth)acrylate, N,N,N-triethylaminomethyl (meth)acrylate, 5 N,N,N-trimethylaminoethyl (meth)acrylate, N,N,N-triethylaminoethyl (meth)acrylate, N,N,N-trimethylaminobutyl (meth)acrylate, N,N,N-triethylaminobutyl (meth)acrylate, N,N,N-trimethylaminoethyl (meth)acrylate, 10 N,N,N-trimethylaminooctyl (meth)acrylate, N,N,N-trimethylaminododecyl (meth)acrylate, N-[3-(trimethylamino)propyl]methacrylamide and N-[3-(trimethylamino)propyl]acrylamide, N-[3-(dimethylamino)butyl]methacrylamide, 15 N-[8-(trimethylamino)octyl]methacrylamide, N-[12-(trimethylamino)dodecyl]methacrylamide, N-[3-(triethylamino)propyl]methacrylamide and N-[3-(triethylamino)propyl]acrylamide, (meth)acryloyloxyhydroxypropyltrimethylamine, 20 (meth)acryloyloxyhydroxypropyltriethylamine, 3-methyl-1-vinylimidazole and N,N-dimethyl-N,N-diallylamine.
5. The use as claimed in any of claims 1 to 4, where the polymers are obtainable starting from mixtures of 25 3-methyl-1-vinylimidazolium methylsulfate and N,N-dimethyl-N,N-diallylammmonium chloride as component (a1).
6. The use as claimed in any of claims 1 to 5, where the monomer (a2) is chosen from free-radically polymerizable unsaturated 30 primary, secondary and tertiary amines, unsaturated acids and unsaturated halides.
7. The use as claimed in any of claims 1 to 6, where the monomer (a2) is an amine chosen from the group of compounds 35 consisting of
- a) aminoalkyl acrylates, aminoalkyl methacrylates, aminoalkylacrylamides and aminoalkylmethacrylamides of the formula (VIII)

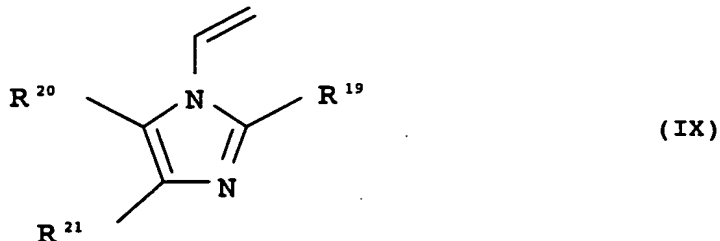


(VIII)

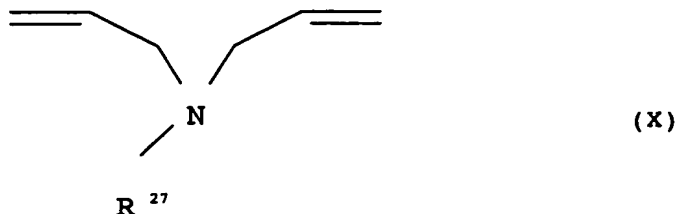
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where for  $R^{14}$  to  $R^{18}$  the definitions given for formula (IV) in claim 3 b) apply, and  $R^{25}$  and  $R^{26}$  are in each case and independently of one another chosen from the group consisting of hydrogen,  $C_1$ - $C_{40}$  linear- or branched-chain alkyl, formyl,  $C_1$ - $C_{10}$  linear- or branched-chain acyl, N,N-dimethylaminoethyl, 2-hydroxyethyl, 2-methoxyethyl, 2-ethoxyethyl, hydroxypropyl, methoxypropyl, ethoxypropyl or benzyl,

- b) N-vinylimidazoles of the formula IX, where for  $R^{19}$  to  $R^{21}$ , independently of one another, the definitions given for formula (V) in claim 3 c) apply,

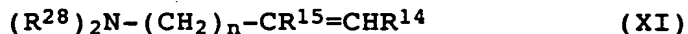


- c) diallylamines of the formula (X)



where  $R^{27}$  = hydrogen or  $C_1$ - to  $C_{24}$ -alkyl,

- d) 1,3-divinylimidazolid-2-one or N-disubstituted vinylamines of the formula (XI):



where  $R^{14}$ ,  $R^{15}$  and  $n$  have the same meanings as in the formulae (IIIa) and (IIIb), and the radicals  $R^{28}$  can be chosen from the group consisting of hydrogen  $C_1$ - $C_{40}$  linear- or branched-chain alkyl radicals, formyl,  $C_1$ - $C_{10}$  linear- or branched-chain acyl, N,N-dimethylaminoethyl, 2-hydroxyethyl, 2-methoxyethyl, 2-ethoxyethyl, hydroxypropyl, methoxypropyl, ethoxypropyl or benzyl, where, when  $n=0$ , both radicals  $R^{28}$  are not hydrogen at the same time.

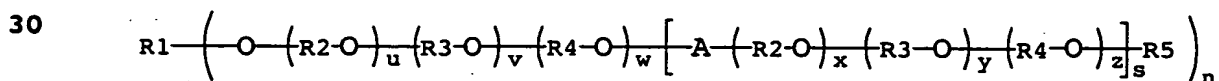
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8. The use as claimed in any of claims 1 to 7, where the monomer (a2) is chosen from N,N-dimethylaminoethyl methacrylate, N-[3-(dimethylamino)propyl]methacrylamide, N-methylaminoethyl methacrylate, N-[3-(methylamino)propyl]methacrylamide,  
5 aminoethyl methacrylate and N-[3-aminopropyl]methacrylamide, N-vinylimidazole, 1-vinyl-2-methylvinylimidazole and N,N-diallylamine.
9. The use as claimed in any of claims 6 to 8, where the  
10 quaternization takes place with an alkyl halide having 1 to 24 carbon atoms, a dialkyl sulfate having 1 to 24 carbon atoms, an alkylene oxide or an epichlorohydrin.
10. The use as claimed in claim 6, where the monomer (a2) is an  
15 unsaturated halide chosen from haloalkyl acrylates or haloalkyl methacrylates.
11. The use as claimed in claim 10, where the quaternization  
20 takes place with a trialkylamine.
12. The use as claimed in any of claims 1 to 11, where the  
monomer (c) is chosen from the group consisting of  
N-vinyllactams, N-vinylcarboxamides, hydroxyalkyl acrylates,  
ethylenically unsaturated amides, vinylimidazoles,  
25 unsaturated acids and unsaturated amines.
13. The use as claimed in any of claims 1 to 12, where the  
monomer (c) is chosen from the group consisting of  
N-vinylpyrrolidone, N-vinylpiperidone, N-vinylcaprolactam,  
30 N-vinylformamide, N-ethyl-N-vinylacetamide or  
N-methyl-N-vinylacetamide, 2-hydroxyethyl acrylate,  
2-hydroxyethyl methacrylate, 2-hydroxypropyl methacrylate,  
butanediol monoacrylate, acrylamide, methacrylamide,  
N-vinylimidazole, acrylic acid, maleic acid, methacrylic  
35 acid, 2-acrylamido-2-methylpropanesulfonic acid,  
dimethylaminoethyl acrylate and dimethylamino methacrylate.
14. The use as claimed in any of claims 1 to 13, where the  
monomer (d) is chosen from the group consisting of  
40 C<sub>1</sub>-C<sub>10</sub>-alkyl esters of monoethylenically unsaturated  
C<sub>3</sub>-C<sub>6</sub>-carboxylic acids, di-C<sub>1</sub>-C<sub>10</sub>-alkyl esters of  
ethylenically unsaturated dicarboxylic acids, hydrocarbons  
having at least one free-radically polymerizable  
carbon-carbon double bond, vinyl, vinylidene or allyl  
45 halides, vinyl, allyl and methallyl esters of C<sub>1</sub>-C<sub>40</sub> linear,  
C<sub>3</sub>-C<sub>40</sub> branched-chain or C<sub>3</sub>-C<sub>40</sub> carbocyclic carboxylic acids  
of aliphatic, saturated and unsaturated nature, vinyl, allyl

and methallyl ethers of linear or branched, aliphatic alcohols having 2 to 20 carbon atoms.

15. The use as claimed in any of claims 1 to 14, where the monomer (d) is chosen from the group consisting of methyl acrylate, ethyl acrylate, propyl acrylate, n-butyl acrylate, isobutyl acrylate, t-butyl acrylate, 2-ethylhexyl acrylate, decyl acrylate, methyl methacrylate, ethyl methacrylate, propyl methacrylate, n-butyl methacrylate, isobutyl methacrylate, t-butyl methacrylate, 2-ethylhexyl methacrylate, decyl methacrylate, methyl ethacrylate, ethyl ethacrylate, n-butyl ethacrylate, isobutyl ethacrylate, t-butyl ethacrylate, 2-ethylhexyl ethacrylate, decyl ethacrylate, stearyl acrylate, stearyl (meth)acrylate, preferably styrene, alpha-methylstyrene, tert-butylstyrene, butadiene, isoprene, cyclohexadiene, ethylene, propylene, 1-butene, 2-butene, isobutylene, vinyltoluene, vinyl chloride, vinylidene chloride, allyl chloride, vinyl acetate, vinyl propionate, vinyl butyrate, vinyl valerate, vinyl hexanoate, vinyl 2-ethylhexanoate, vinyl decanoate, vinyl laurate, vinyl stearate, vinyl methyl ether, vinyl ethyl ether, vinyl dodecyl ether, vinyl hexadecyl ether, vinyl stearyl ether, acrylamidoglycolic acid, fumaric acid and crotonic acid.

16. The use as claimed in any of claims 1 to 15, where the polyether-containing compound (b) is described by the formula I,



(I)

- in which the variables, independently of one another, have the following meanings:

$R^1$  is hydrogen,  $C_1$ - $C_{24}$ -alkyl,  $R^6$ -C(=O)-,  $R^6$ -NH-C(=O)-, polyalcohol radical;

$R^5$  is hydrogen,  $C_1$ - $C_{24}$ -alkyl,  $R^6$ -C(=O)-,  $R^6$ -NH-C(=O)-;

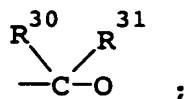
$R^2$  to  $R^4$  are  $-(CH_2)_2-$ ,  $-(CH_2)_3-$ ,  $-(CH_2)_4-$ ,  $-CH_2-CH(R^6)-$ ,  $-CH_2-CHOR^7-CH_2-$ ;

$R^6$  is  $C_1$ - $C_{24}$ -alkyl;

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R<sup>7</sup> is hydrogen, C<sub>1</sub>-C<sub>24</sub>-alkyl, R<sup>6</sup>-C(=O)-, R<sup>6</sup>-NH-C(=O)-;

A is -C(=O)-O, -C(=O)-B-C(=O)-O,  
 -CH<sub>2</sub>-CH(-OH)-B-CH(-OH)-CH<sub>2</sub>-O,  
 -C(=O)-NH-B-NH-C(=O)-O;



B is -(CH<sub>2</sub>)<sub>t</sub>-, arylene, optionally substituted;

R<sup>30</sup>, R<sup>31</sup> are hydrogen, C<sub>1</sub>-C<sub>24</sub>-alkyl, C<sub>1</sub>-C<sub>24</sub>-hydroxyalkyl,  
 benzyl or phenyl;

n is 1 when R<sup>1</sup> is not a polyalcohol radical or

n is 1 to 1 000 when R<sup>1</sup> is a polyalcohol radical

s is 0 to 1 000;

t is 1 to 12;

u is 1 to 5 000;

v is 0 to 5 000;

w is 0 to 5 000;

x is 0 to 5 000;

y is 0 to 5 000;

z is 0 to 5 000.

17. The use as claimed in any of claims 1 to 16, where the  
 polyether-containing compound (b) described by the formula I  
 has an average molecular weight of from 500 to 50 000  
 (number-average) and the variables, independently of one  
 another, have the following meanings:

R<sup>1</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, R<sup>6</sup>-C(=O)-, R<sup>6</sup>-NH-C(=O)-;  
 R<sup>5</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, R<sup>6</sup>-C(=O)-, R<sup>6</sup>-NH-C(=O)-;  
 R<sup>2</sup> to R<sup>4</sup> are -(CH<sub>2</sub>)<sub>2</sub>-, -(CH<sub>2</sub>)<sub>3</sub>-, -(CH<sub>2</sub>)<sub>4</sub>-, -CH<sub>2</sub>-CH(R<sup>6</sup>)-,  
 -CH<sub>2</sub>-CHOR<sup>7</sup>-CH<sub>2</sub>-;

R<sup>6</sup> is C<sub>1</sub>-C<sub>6</sub>-alkyl;

R<sup>7</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, R<sup>6</sup>-C(=O)-, R<sup>6</sup>-NH-C(=O)-;

n is 1;



s is 0;  
u is 5 to 500;  
v is 0 to 500;  
w is 0 to 500.

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18. The use as claimed in any of claims 1 to 17, where the polyether-containing compound is a polymer, copolymer or block copolymer of at least one compound chosen from ethylene oxide and propylene oxide.

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19. The use as claimed in any of claims 1 to 15, where the polyether-containing compound (b) is a polyether-containing silicone derivative.

15 20. The use as claimed in any of claims 1 to 15, where the polyether-containing compound (b) is obtained by reacting polyethyleneimines with alkylene oxides.

20 21. The use as claimed in any of claims 1 to 15, where the polyether-containing compound (b) are obtainable by polymerization of ethylenically unsaturated alkylene oxide-containing monomers and optionally further copolymerizable monomers.

25 22. The use of polymers as claimed in any of claims 1 to 21, where the quantitative ratios are as follows:

- 30 a1) 3 - 30% by weight  
b) 70 - 97% by weight  
c) 0 - 15% by weight  
d) 0 - 15% by weight

35 and the percentages by weight of the individual components a1, b and optionally c and d add up in each case to 100% by weight.

23. The use of the polymers as claimed in any of claims 1 to 22, where the quantitative ratios are as follows:

- 40 a1) 4 - 12% by weight  
b) 88 - 96% by weight  
c) 0% by weight  
d) 0% by weight

45 and the percentages by weight of the individual components a1 and b add up in each case to 100% by weight.

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24. A cationic polymer obtainable by polymerization of  
from 3 to 30% by weight of at least one cationic, quaternary,  
free-radically polymerizable monomer (a1)  
5  
in the presence of from 70 to 97% by weight of at least one  
polyether-containing compound (b) and  
optionally from 0 to 15% by weight of one or more further  
10 free-radically polymerizable monomers (c) with a solubility  
in water above 60 g/l at 25°C and  
optionally from 0 to 15% by weight of one or more further  
free-radically polymerizable monomers (d) with a solubility  
15 in water below 60 g/l at 25°C,  
where the molar ratio of the sum of the monomers (a1) and (c)  
to the sum of the monomers (d) is at least 2 to 1,  
20 where the water content in the reaction mixture during the  
polymerization is less than 20% by weight, and  
where the percentages by weight of the individual components  
a1, b and optionally c and d add up in each case to 100% by  
25 weight.
25. A cationic polymer as claimed in claim 24, where  
i) the monomers (a1) are defined as in any of claims 2 to 5  
30 ii) the polyether-containing compound (b) is defined as in  
any of claims 16 to 21,  
iii) the monomers (c) are defined as in either claim 12 or 13,  
and/or  
iv) the monomers (d) are defined as in either claim 14 or 15.  
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26. A cationic polymer as claimed in either claim 24 or 25, where  
the composition of the polymer is defined as in either of  
claims 22 and 23.
- 40 27. A process for the preparation of cationic polymers as claimed  
in any of claims 24 to 26, which comprises polymerizing  
from 3 to 30% by weight of at least one cationic, quaternary  
free-radically polymerizable monomer (a1)  
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in the presence of from 70 to 97% by weight of at least one polyether-containing compound (b) and

5 optionally from 0 to 15% by weight of one or more further free-radically polymerizable monomers (c) with a solubility in water of more than 60 g/l at 25°C and

10 optionally from 0 to 15% by weight of one or more further free-radically polymerizable monomers (d) with a solubility in water of less than 60 g/l at 25°C,

where the molar ratio of the sum of the monomers (a1) and (c) to the sum of the monomers (d) is at least 2 to 1,

15 where the water content in the reaction mixture during the polymerization is less than 20% by weight, and

20 where the percentages by weight of the individual components a1, b and optionally c and d add up in each case to 100% by weight.

28. A hair cosmetic formulation with the following composition:

- 25 a) 0.05 - 20% by weight of a cationic polymer corresponding to any of claims 1 to 26  
b) 20 - 99.95% by weight of water and/or alcohol  
c) 0 - 79.05% by weight of further constituents.

29. A hair cosmetic formulation with the following composition:  
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- a) 0.1 - 10% by weight of a cationic polymer as claimed in any of claims 1 to 26  
b) 20 - 99.9% by weight of water and/or alcohol  
35 c) 0 - 70% by weight of a propellant  
d) 0 - 20% by weight of further constituents.

30. A hair cosmetic formulation with the following composition:

- 40 a) 0.1 - 10% by weight of a cationic polymer as claimed in any of claims 1 to 26  
b) 55 - 94.8% by weight of water and/or alcohol  
c) 5 - 20% by weight of a propellant  
d) 0.1 - 5% by weight of an emulsifier  
45 e) 0 - 10% by weight of further constituents.

31. A hair cosmetic formulation of the following composition:

- a) 0.1 - 10% by weight of a cationic polymer as claimed in any of claims 1 to 26
- 5 b) 60 - 99.85% by weight of water and/or alcohol
- c) 0.05 - 10% by weight of a gel former
- d) 0 - 20% by weight of further constituents.

32. A hair cosmetic formulation with the following composition:

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- a) 0.05 - 10% by weight of a cationic polymer as claimed in any of claims 1 to 26,
- b) 25 - 94.95% by weight of water
- c) 5 - 50% by weight of surfactants
- 15 d) 0 - 5% by weight of a further conditioning agent
- e) 0 - 10% by weight of further cosmetic constituents.

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Cationic polymers and use thereof in cosmetic formulations

Abstract

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The present invention relates to cationic polymers, to processes for the preparation thereof, and to the use thereof in cosmetic formulations.

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